F ENT COOPERATION TREA

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing:	
14 December 2000 (14.12.00)	
International application No.:	Applicant's or agent's file reference:
PCT/AU00/00647	FP12911
International filing date:	Priority date:
08 June 2000 (08.06.00)	08 June 1999 (08.06.99)
Applicant: HARRIS, Martin, Russell et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International preliminary Examining Authority on:

10 August 2000 (10.08.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer:
Facsimile No.: (41-22) 740.14.35	J. Zahra Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

3707836

ATENT COOPERATION TREAT

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
FP12911		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/AU00/00647	8 June 2000	8 June 1999

Applicant

OPTISCAN PTY LTD et al

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (See Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1

☒ as suggested by the applicant.

☐ None of the figures

☐ because the applicant failed to suggest a figure

☐ because this figure better characterizes the invention

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A tuning fork apparatus (10) is vibrated via a coil (18) which encloses at least a portion of both tines (14, 16), thereby inducing mutually repulsive magnetic fields in the tines (14, 16). The coil may be elliptical in shape to reduce the size of the apparatus (10). A ferromagnetic housing may be located outside the coil (18) to form closed magnetic circuits with the tines (14,16), to increase their magnetic repulsion. The tines (14, 16) can have different masses, such that the more massive tine is substantially undeflected. Applications include optical fibre scanning in endoscopes and microscopes.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU00/00647

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G02B 26/10, G01C 19/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: G02B, G01C 19/56, G01P 9/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI
JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Patent Abstracts of Japan, P-500, page 97, JP 61-102512 A (TOKYO KEIKI CO LTD) 21 May 1986	
X	Abstract	1-3, 12, 17-19, 25
Y		4, 6, 10, 14-16, 20, 22, 27-29
	WO 99/04301 A (OPTISCAN PTY. LTD.) 28 January 1999	
Y	Pages 3, 6-7, Figure 1	4, 10, 14-16, 20, 27-29
	GB 2114745 A (BESTOBELL (UK) LIMITED) 24 August 1983	
Y	Whole document	6, 13-14, 22, 27-28

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 July 2000	25 JUL 2000
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	MICHAEL HALL Telephone No : (02) 6283 2474

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/00647

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
WO	9904301	AU	83249/98	GB	2340332

END OF ANNEX

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference AJM:MG:FP12911	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU00/00647**	International Filing Date *(day/month/year)* 8 June 2000	Priority Date *(day/month/year)* 8 June 1999
International Patent Classification (IPC) or national classification and IPC **Int. Cl.** [7] G02B 26/10, G01C 19/56		
Applicant OPTISCAN PTY LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of **4** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
10 August 2000	20 April 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **MICHAEL HALL** Telephone No. (02) 6283 2474

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU00/00647

I. Basis of the report

1. With regard to the **elements** of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1, 3, 5-15,** as originally filed,
  pages , filed with the demand,
  pages **2, 4,** received on **22 March 2001** with the letter of **20 March 2001**
- [X] the claims, pages **17, 19,** as originally filed,
  pages , as amended (together with any statement) under Article 19,
  pages , filed with the demand,
  pages **16, 18,** received on **22 March 2001** with the letter of **20 March 2001**
- [X] the drawings, pages **1-4,** as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [ ] the sequence listing part of the description:
  pages , as originally filed
  pages , filed with the demand
  pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

- [ ] contained in the international application in written form.
- [ ] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-29	YES
	Claims		NO
Inventive step (IS)	Claims	1-29	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-29	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Citation

D1 : Patent Abstracts of Japan, P-500, page 97 (JP 61-102512)

NOVELTY (N) AND INVENTIVE STEP (IS)

D1 represents the closest prior art, and teaches a tuning fork 1 with base 3 and tines 11, 11A; where a single driving coil 14 receives the upper part of the tines, and where current through the coil induces repulsive magnetic fields in the tines, thereby oscillating the tines. However, D1 teaches an AC driving current. This is incompatible with the use of a varying substantially uni-directional current as per the claims (eg, lines 10-11 of claim 1), and is moreover relatively inefficient (see page 9 lines 16-27 of the instant application). Hence the claims are novel and inventive over D1.

INDUSTRIAL APPLICABILITY (IA)

The subject matter of the claims is applicable to optical scanning devices.

NIC

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 December 2000 (14.12.2000)

PCT

(10) International Publication Number
WO 00/75712 A1

(51) International Patent Classification[7]: G02B 26/10, G01C 19/56

(21) International Application Number: PCT/AU00/00647

(22) International Filing Date: 8 June 2000 (08.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PQ 0815 8 June 1999 (08.06.1999) AU

08 Dec 01 / 30 mos

(71) Applicant *(for all designated States except US)*: OPTISCAN PTY LTD [AU/AU]; 27 Normanby Road, Notting Hill, Victoria 3168 (AU).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: HARRIS, Martin, Russell [AU/AU]; 163 Peel Street, Windsor, Victoria 3181 (AU). ROSMAN, Gavan, Edmund [AU/AU]; 13 Davis Avenue, Camberwell, Victoria 3124 (AU). RUDGE, James [AU/AU]; 39 Larne Avenue, Donvale, Victoria 3111 (AU).

(74) Agent: GRIFFITH HACK; Level 3, 509 St Kilda Road, Melbourne, Victoria 3004 (AU).

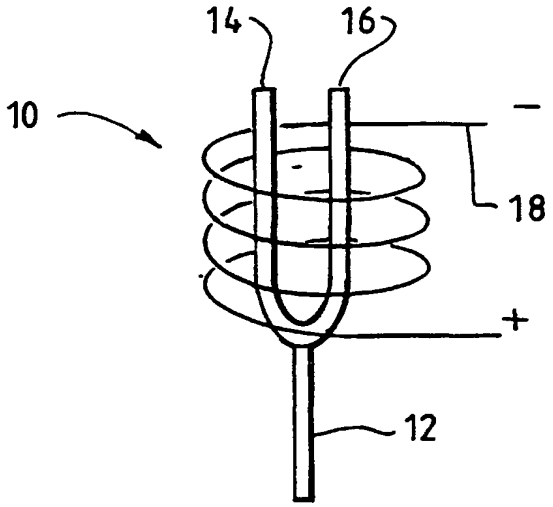
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ELECTRICALLY OPERATED TUNING FORK



(57) Abstract: A tuning fork apparatus (10) is vibrated via a coil (18) which encloses at least a portion of both tines (14, 16), thereby inducing mutually repulsive magnetic fields in the tines (14, 16). The coil may be elliptical in shape to reduce the size of the apparatus (10). A ferromagnetic housing may be located outside the coil (18) to form closed magnetic circuits with the tines (14, 16), to increase their magnetic repulsion. The tines (14, 16) can have different masses, such that the more massive tine is substantially undeflected. Applications include optical fibre scanning in endoscopes and microscopes.

WO 00/75712 A1

REPLACED BY ART 34 AMDT

induced;

a electrical coil for receiving at least a portion of both tines of said tuning fork;

whereby at least one of said tines can be vibrated relative to the other of said tines by passing a varying current through said coil and thereby inducing mutually repulsive magnetic fields in said tines.

Preferably said material is magnetically permeable, and more preferably said material is ferromagnetic.

Thus, although this method of vibrating the tine or tines may be less efficient than the existing arrangements (in which the magnetic fields produced by current in the electromagnets are longitudinal); here they are essentially transverse, resulting in mutual repulsion between the tines even in the absence of any other magnetically active material. Preferably the tines are vibrated at the resonant frequency of the tuning fork. With this configuration, both winding strength and packing density of the coil can be maximized by eliminating the need for windings between the tines. The winding is external to the fork and preferably extends over nearly the entire length of the fork, contributing to driving force through induced magnetism even in the base region where the tines are joined. This arrangement therefore allows the largest winding volume, though the winding strength is reduced owing to the larger diameter of the turns compared with the localised windings of the existing designs. However this is compensated by the large cross section available for the winding. At any point along the entire length of the fork the (typically coaxial) winding of the coil contributes to the driving force, even the region beyond the base of the tuning fork.

Preferably said tips of the tines protrude from the coil so that said at least one of said tips can vibrate by a

on said at least one of said tines.

Pref rably said coil is a former-less coil.

Preferably said apparatus includes a sensor to provide a signal indicative of the position of said at least one tine so that the tuning fork can be maintained at resonance.

Preferably said sensor is a piexoelectric sensor, a fibre sensor system, a hall effect sensor or a series capacitive sensor.

The present invention also includes an endoscope, microscope or endomicroscope including an apparatus as described above.

The present invention also includes a scanning head for an endoscope, microscope or endomicroscope including an apparatus as described above.

The present invention still further a method for electrically vibrating a tuning fork having a base and a pair of tines, said tines and having tips remote from said base and formed of or including material in which a magnetic field can be induced, said method comprising:

locating at least a portion of said tines within a electrical coil; and

passing a varying current through said coil to induce mutually repulsive magnetic fields in said tines and thereby inducing at least one of said tines to vibrated relative to the other of said tines.

Preferably said material is magnetically permeable, and more preferably said material is ferromagnetic.

Preferably said method includes arranging said tips to protrude from said coil so that said at least one of said

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An electrically operated tuning fork apparatus, comprising:

a tuning fork having a base and a pair of tines, said tines and having tips remote from said base and formed of or including material in which a magnetic field can be induced;

a electrical coil for receiving at least a portion of both tines of said tuning fork;

whereby at least one of said tines can be vibrated relative to the other of said tines by passing a varying current through said coil and thereby inducing mutually repulsive magnetic fields in said tines.

2. An apparatus as claimed in claim 1, wherein said material is magnetically permeable.

3. An apparatus as claimed in claim 1, wherein said material is ferromagnetic.

4. An apparatus as claimed in any one of the preceding claims, wherein said tips of the tines protrude from the coil so that said at least one of said tips can vibrate by a greater amplitude than can be accommodated by said coil.

5. An apparatus as claimed in any one of the preceding claims, wherein said coil is elliptical, with a major axis oriented in the plane of vibration of the tines, so that a reduction in the total size of the apparatus can be achieved.

6. An apparatus as claimed in any one of the preceding claims, wherein said apparatus includes additional magnetically permeable material located outside said coil for providing a return path for the magnetic field produced by said coil, and attracting said tines towards said

15. An endoscope, microscope or endomicroscope including an apparatus as claimed in any one of the preceding claims.

16. A scanning head for an endoscope, microscope or endomicroscope including an apparatus as claimed in any one of claims 1 to 14.

17. A method for electrically vibrating a tuning fork having a base and a pair of tines, said tines and having tips remote from said base and formed of or including material in which a magnetic field can be induced, said method comprising:

locating at least a portion of said tines within a electrical coil; and

passing a varying current through said coil to induce mutually repulsive magnetic fields in said tines and thereby inducing at least one of said tines to vibrated relative to the other of said tines.

18. A method as claimed in claims 17, wherein said material is magnetically permeable.

19. A method as claimed in claims 17, wherein said material is ferromagnetic.

20. A method as claimed in any one of claims 17 to 19, including arranging said tips to protrude from said coil so that said at least one of said tips can vibrate by a greater amplitude than can be accommodated by said coil.

21. A method as claimed in any one of claims 17 to 20, wherein said coil is elliptical, with a major axis oriented in the plane of vibration of said at least one tine.

22. A method as claimed in any one of claims 17 to 21, including locating additional magnetically permeable

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU00/00647

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G02B 26/10, G01C 19/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: G02B, G01C 19/56, G01P 9/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI
JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Patent Abstracts of Japan, P-500, page 97, JP 61-102512 A (TOKYO KEIKI CO LTD) 21 May 1986	
X Y	Abstract	1-3, 12, 17-19, 25 4, 6, 10, 14-16, 20, 22, 27-29
	WO 99/04301 A (OPTISCAN PTY. LTD.) 28 January 1999	
Y	Pages 3, 6-7, Figure 1	4, 10, 14-16, 20, 27-29
	GB 2114745 A (BESTOBELL (UK) LIMITED) 24 August 1983	
Y	Whole document	6, 13-14, 22, 27-28

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 July 2000	25 JUL 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **MICHAEL HALL** Telephone No : (02) 6283 2474

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU00/00647

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
WO	9904301	AU	83249/98	GB	2340332

END OF ANNEX